

Claims

1. A method for cleaning a source gas introduction pipe used in a CVD apparatus, which cleans contaminant mainly containing carbon powder adhering to an outer surface of the source gas introduction pipe during processes in which a plastic bottle is accommodated into a sealable deposition chamber having a function of an outer electrode, source gas is introduced from a source gas introduction pipe which is elevatably inserted into the plastic bottle and also acts as an inner electrode, and the source gas is excited into plasma to form a CVD (Chemical Vapor Deposition) film on an inner surface of the plastic bottle, wherein while compressed air is sprayed toward the contaminant, the contaminant is exhausted outside a system of the deposition chamber by suction and exhausting means so that the contaminant removed by the spray of the compressed air is not transferred to sides of the deposition chamber and the plastic container in which the CVD film is formed in a process for extracting the source gas introduction pipe from the plastic container after the CVD film is formed on the inner surface of the plastic container.

2. The method for cleaning a source gas introduction pipe used in a CVD apparatus according to claim 1, wherein the compressed air is sprayed toward a centripetal direction of the source gas introduction pipe from a compressed air spray portion provided in an upper portion of the deposition chamber or at

a position above the deposition chamber.

3. The method for cleaning a source gas introduction pipe used in a CVD apparatus according to claims 1 or 2, wherein the compressed air and the contaminant are sucked and removed into a suction and exhaust portion provided at the position above the spray portion by the suction and exhausting means.

4. The method for cleaning a source gas introduction pipe used in a CVD apparatus according to claim 1, wherein the compressed air spray portion is provided in the upper portion of the deposition chamber or at the position above the deposition chamber, the suction and exhaust portion is provided at the position above the spray portion, a second compressed air spray portion is provided at the position above the suction and exhaust portion, the spray portion sprays the compressed air from the bottom toward the top, the second spray portion sprays the compressed air from the top toward the bottom, and the suction and exhaust portion sucks and removes the compressed air and the contaminant.

5. The method for cleaning a source gas introduction pipe used in a CVD apparatus according to any one of claims 1, 2, 3, and 4, wherein the amount of suction and exhaust by the suction and exhausting means is larger than the amount of air supply of the compressed air.

6. The method for cleaning a source gas introduction pipe used in a CVD apparatus according to any one of claims 1, 2, 3, 4, and 5, wherein deposition of the CVD film is separately performed in the plurality of deposition chambers arranged in a circle on a turntable, the contaminant mainly containing the carbon powder which adhere to the outer surface of the source gas introduction pipe is removed by spraying the compressed air in the process for extracting the source gas introduction pipe from the plastic container, and the process for sucking and exhausting the removed contaminant outside the system of the deposition chamber is completed, while the turntable is rotated one turn.

7. A method for cleaning a source gas introduction pipe used in a CVD apparatus, which cleans contaminant mainly containing carbon powder adhering to an outer surface of the source gas introduction pipe during processes in which a plastic bottle is accommodated into a sealable deposition chamber having a function of an outer electrode, source gas is introduced from a source gas introduction pipe which is elevatably inserted into the plastic bottle and also acts as an inner electrode, and the source gas is excited into plasma to form a CVD (Chemical Vapor Deposition) film on an inner surface of the plastic bottle, wherein while ultrasonic air is blown toward the contaminant, the contaminant is exhausted outside a system of the deposition chamber by suction and exhausting means so that the contaminant removed by the blow of the ultrasonic air is not transferred

to sides of the deposition chamber and the plastic container in which the CVD film is formed in a process for extracting the source gas introduction pipe from the plastic container after the CVD film is formed on the inner surface of the plastic container.

8. The method for cleaning a source gas introduction pipe used in a CVD apparatus according to claim 7, wherein the ultrasonic air is blown toward a centripetal direction of the source gas introduction pipe from an ultrasonic air blow portion provided in an upper portion of the deposition chamber or at a position above the deposition chamber.

9. The method for cleaning a source gas introduction pipe used in a CVD apparatus according to claims 7 or 8, wherein the ultrasonic air and the contaminant are sucked and removed into a suction and exhaust portion provided at the position above the blow portion by the suction and exhausting means.

10. The method for cleaning a source gas introduction pipe used in a CVD apparatus according to claim 7, wherein the ultrasonic air blow portion is provided in the upper portion of the deposition chamber or at the position above the deposition chamber, the suction and exhaust portion is provided at the position above the blow portion, a second ultrasonic air blow portion is provided at the position above the suction and exhaust portion, the blow portion blows the ultrasonic air from the bottom

toward the top and the second blow portion blows the ultrasonic air from the top toward the bottom, and the suction and exhaust portion sucks and removes the ultrasonic air and the contaminant.

11. The method for cleaning a source gas introduction pipe used in a CVD apparatus according to any one of claims 7, 8, 9, and 10, wherein the amount of suction and exhaust by the suction and exhausting means is larger than the amount of air supply of the ultrasonic air.

12. The method for cleaning a source gas introduction pipe used in a CVD apparatus according to any one of claims 7, 8, 9, 10, and 11, wherein deposition of the CVD film is separately performed in the plurality of deposition chambers arranged in a circle on a turntable, the contaminant mainly containing the carbon powder which adhere to the outer surface of the source gas introduction pipe is removed by blowing the ultrasonic air in the process for extracting the source gas introduction pipe from the plastic container, and the process for sucking and exhausting the removed contaminant outside the system of the deposition chamber is completed, while the turntable is rotated one turn.

13. An apparatus for cleaning a source gas introduction pipe used in a CVD apparatus, which cleans contaminant mainly containing carbon powder adhering to an outer surface of the source gas introduction pipe during processes in which a plastic

bottle is accommodated into a sealable deposition chamber having a function of an outer electrode, source gas is introduced from a source gas introduction pipe which is elevatably inserted into the plastic bottle and also acts as an inner electrode, and the source gas is excited into plasma to form a CVD (Chemical Vapor Deposition) film on an inner surface of the plastic bottle, comprising source gas introduction pipe extracting means for extracting the source gas introduction pipe from the plastic container in synchronization with a time after the formation of the CVD film on the inner surface of the plastic container, compressed air spraying means for spraying compressed air toward the contaminant, and suction and exhausting means for exhausting the contaminant removed by the spray of the compressed air outside a system of the deposition chamber so that the contaminant is not transferred to sides of the deposition chamber and the plastic container in which the CVD film is formed.

14. The apparatus for cleaning a source gas introduction pipe used in a CVD apparatus according to claim 13, wherein a spray portion of the compressed air sprayed by the compressed air spraying means is arranged around the outside of the source gas introduction pipe and in an upper portion of the deposition chamber or at a position above the deposition chamber.

15. The apparatus for cleaning a source gas introduction pipe used in a CVD apparatus according to claims 13 or 14, wherein a suction and exhaust portion for sucking and removing the

compressed air and the contaminant is arranged around the outside of the source gas introduction pipe and at the position above the spray portion.

16. The apparatus for cleaning a source gas introduction pipe used in a CVD apparatus according to claim 13, wherein the spray portion of the compressed air sprayed by the compressed air spraying means is arranged around the outside of the source gas introduction pipe and in the upper portion of the deposition chamber or at the position above the deposition chamber, the suction and exhaust portion for sucking and removing the compressed air and the contaminant is arranged around the outside of the source gas introduction pipe and at the position above the spray portion, a second spray portion of the compressed air sprayed by the compressed air spraying means is arranged around the outside of the source gas introduction pipe and at the position above the suction and exhaust portion, a compressed air spray direction of the spray portion is orientated upward, and the compressed air spray direction of the second spray portion is orientated downward.

17. An apparatus for cleaning a source gas introduction pipe used in a CVD apparatus, which cleans contaminant mainly containing carbon powder adhering to an outer surface of the source gas introduction pipe during processes in which a plastic bottle is accommodated into a sealable deposition chamber having a function of an outer electrode, source gas is introduced from

a source gas introduction pipe which is elevatably inserted into the plastic bottle and also acts as an inner electrode, and the source gas is excited into plasma to form a CVD (Chemical Vapor Deposition) film on an inner surface of the plastic bottle, comprising source gas introduction pipe extracting means for extracting the source gas introduction pipe from the plastic container in synchronization with a time after the formation of the CVD film on the inner surface of the plastic container, ultrasonic air blowing means for blowing ultrasonic air toward the contaminant, and suction and exhausting means for exhausting the contaminant removed by the blow of the ultrasonic air outside a system of the deposition chamber so that the contaminant is not transferred to sides of the deposition chamber and the plastic container in which the CVD film is formed.

18. The apparatus for cleaning a source gas introduction pipe used in a CVD apparatus according to claim 17, wherein a blow portion of the ultrasonic air blown by the ultrasonic air blowing means is arranged in an upper portion of the deposition chamber or at a position above the deposition chamber.

19. The apparatus for cleaning a source gas introduction pipe used in a CVD apparatus according to claims 17 or 18, wherein a suction and exhaust portion for sucking and removing the ultrasonic air and the contaminant is arranged at the position above the blow portion.

20. The apparatus for cleaning a source gas introduction pipe used in a CVD apparatus according to claim 17, wherein the blow portion of the ultrasonic air blown by the ultrasonic air blowing means is arranged in the upper portion of the deposition chamber or at the position above the deposition chamber, the suction and exhaust portion for sucking and removing the ultrasonic air and the contaminant is arranged at the position above the blow portion, a second blow portion of the ultrasonic air blown by the ultrasonic air blowing means is arranged at the position above the suction and exhaust portion, an ultrasonic air blow direction of the blow portion is orientated upward, and the ultrasonic air blow direction of the second blow portion is orientated downward.

21. A method for cleaning a source gas introduction pipe used in a CVD apparatus, which cleans contaminant mainly containing carbon powder adhering to an outer surface of the source gas introduction pipe during processes in which a plastic bottle is accommodated into a sealable deposition chamber having a function of an outer electrode, source gas is introduced from a source gas introduction pipe which is elevatably inserted into the plastic bottle, and the source gas is excited into plasma with a micro wave to form a CVD (Chemical Vapor Deposition) film on an inner surface of the plastic bottle, wherein while compressed air is sprayed toward the contaminant or ultrasonic air is blown toward the contaminant, the contaminant removed by the spray of the compressed air or the blow of the ultrasonic

air is exhausted outside a system of the deposition chamber by suction and exhausting means so that the contaminant is not transferred to sides of the deposition chamber and the plastic container in which the CVD film is formed in a process for extracting the source gas introduction pipe from the plastic container after the CVD film is formed on the inner surface of the plastic container.

22. An apparatus for cleaning a source gas introduction pipe used in a CVD apparatus, which cleans contaminant mainly containing carbon powder adhering to an outer surface of the source gas introduction pipe during processes in which a plastic bottle is accommodated into a sealable deposition chamber having a function of an outer electrode, source gas is introduced from a source gas introduction pipe which is elevatably inserted into the plastic bottle, and the source gas is excited into plasma with a micro wave to form a CVD (Chemical Vapor Deposition) film on an inner surface of the plastic bottle, comprising source gas introduction pipe extracting means for extracting the source gas introduction pipe from the plastic bottle in synchronization with a time after the formation of the CVD film on the inner surface of the plastic bottle, compressed air spraying means for spraying compressed air toward the contaminant, and suction and exhausting means for exhausting the contaminant removed by the spray of the compressed air outside a system of the deposition chamber so that the contaminant is not transferred to sides of the deposition chamber and the plastic container in which the

CVD film is formed.

23. An apparatus for cleaning a source gas introduction pipe used in a CVD apparatus, which cleans contaminant mainly containing carbon powder adhering to an outer surface of the source gas introduction pipe during processes in which a plastic bottle is accommodated into a sealable deposition chamber having a function of an outer electrode, source gas is introduced from a source gas introduction pipe which is elevatably inserted into the plastic bottle, and the source gas is excited into plasma with a micro wave to form a CVD (Chemical Vapor Deposition) film on an inner surface of the plastic bottle, comprising source gas introduction pipe extracting means for extracting the source gas introduction pipe from the plastic container in synchronization with a time after the formation of the CVD film on the inner surface of the plastic container, ultrasonic air blowing means for blowing ultrasonic air toward the contaminant, and suction and exhausting means for exhausting the contaminant removed by the blow of the ultrasonic air outside a system of the deposition chamber so that the contaminant is not transferred to sides of the deposition chamber and the plastic container in which the CVD film is formed.

24. The apparatus for cleaning a source gas introduction pipe according to any one of claims 13 to 23, wherein a substrate material used for the source gas introduction pipe is made of SUS 304 or SUS 316 whose surface is polished or a material in

which SUS 304 or SUS 316 is coated with acid hard gold plating such as 99.7Au-0.3Co and 99.8Au-0.2Ni which is of the material of surface treatment.